No. 38 April-May 1991

solplan review

the independent newsletter of energy conservation, building science & construction practice

Inside . . . . .

Moisture is the major source of problems in construction. Structural damage is caused by it. Moulds and fungi are only the visible symptom - if you've got it it's high time to do something about it. While ventilation will usually resolve moisture problems, it's not always the case. Jim White reviews why moisture is a concern for health,what the physics behind it are, and how to help homeowners cope.

Another moisture problem happens in crawl spaces, which are common in B.C. We review what some of the problems are and report on a study in progress that is going to try and recommend ways to avoid the problems in the first place.

Energy efficient lighting will be getting more attention. We look at lighting options, and how colours are measured so that selection of appropriate lamps can be done knowledgably.

Other items we report on include the latest Ecologo product guidelines, TRC news, advanced house concepts, low energy building research internationally, an index to recent issues and much more.

Contents . . . . .

Moisture, Mould & Ventilation 3
Crawl Space Ventilation & Moisture Control 6
Letter to the Editor 7
Lighting Options 9
TRC News 11
Advanced Concept Houses 12
Low energy houses: does Canada measure up? . . .13
Research on energy systems in the building sector 13
Is new technology the only way to get energy efficiency? 14
Index to Past Issues 15

Moisture in construction

From the Publisher . . . . .

We are aware today about the importance of a healthy environment. Just as we need to have a healthy environment, so we need to have a healthy home. Cleaning up the global environment must start at home.

Work done for the R-2000 Program pointed out the importance of proper air quality management. Right from the beginning the R-2000 program looked at the house as a whole system. All combustion equipment had to be detached from the interior. Combustion air must be supplied, and exhaust gasses positively vented. In response to findings of the monitoring work on R-2000 and standard houses, codes have changed.

I was disturbed to discover recently that there are no requirements for venting gas cooktops and ranges. While most installations will be made with some form of fan exhaust, they don't have to have them.

How big an issue is it? The heat output of a gas range is equivalent to that of a gas fireplace, for which we have stringent venting requirements. Why not the gas range? After all, a cooktop is used every day, while the gas fire place is only used occasionally.

Gas may be a clean burning fuel, but there still are small quantities of impurities that result in harmful byproduct gases to which some people are very sensitive.

Venting of gas ranges is also important as combustion of gas generates vast quantities of water which adds moisture to the house, making a bad situation worse. Even those units that may come with exhaust fans do not suggest how combustion air should be provided to the range. Opening a window is not the solution.

As manufacturers and utilities increase their promotion to generate new markets, it's high time that they address the serious health and safety issues that so far have fallen by the wayside. A review of combustion appliance installation standards as they relate to today's building practices appears to be overdue.

Richard Kadulski
Publisher

solplan review
the independent newsletter of energy conservation, building science & construction practice

Editor-Publisher: Richard Kadulski
Illustrations: Terry Lyster
Contributors: Jim White, Michael Glover, Jeff Chiu,
ISSN: 0828-6574
Date of Issue: May 1991
SOLPLAN REVIEW is published 6 times per year by:
the drawing-room graphic services ltd.
Box 86627, North Vancouver, B.C. V7L 4L2
Tel: 604-689-1841 FAX: 604-689-1841

Street address:
208-1280 Seymour St.
Vancouver, B.C. V6B 3N9

Second Class Mail Registration No. 6855
Postage paid in Vancouver, B.C.
COPYRIGHT 1991 by The Drawing-Room Graphic Services Ltd. All rights reserved. Reproduction without written permission of the publisher is strictly forbidden. Transgressors who don't take heed note: we'll send the godfather's helpers to check on the health of your knees!

SUBSCRIPTIONS: In Canada 1 year $38.52; 2 years $72.76 (includes GST). USA and other foreign payable in US $ 1 year $43.00, 2 years $82.00.
CHANGE OF ADDRESS: include a mailing label or copy all information off label for faster, accurate processing.

CONTRIBUTIONS: Unsolicited contributions and manuscripts welcome. Include self-addressed prestamped mailer if return requested. Publisher not responsible for loss or damage of same.
While every effort is made to provide accurate and complete information, we do not warrant or guarantee the accuracy and completeness of such information.

ADVERTISING POLICY: Publisher's discretion in the acceptance of any advertisement. No endorsement is stated or implied by the publisher.

PRINTED IN CANADA
GST Registration: R105208805

SOLPLAN is a registered trademark of The Drawing-Room Graphic Services Ltd.

Moisture, Mould & Ventilation

Jim White

Why worry about moisture and mould?

We are aware of the structural damage can be caused by moisture. High moisture levels also create ideal conditions for moulds and fungi which can lead to severe health problems.

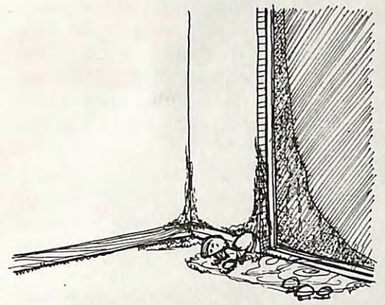
Exposure to fungi, moulds and mildew does not just induce allergies but can lead to serious respiratory disease and in extreme cases death.

Results of a survey of over 14,000 people done last year for Health and Welfare Canada indicated that 39% had at least 1 moisture or mould indication in the home; 11% of non smoking adults had some symptoms of respiratory disease when no moisture problems were present; this went to 19% if even one moisture problem was reported. In the case of young children (traditionally a vulnerable age group) 13.5% had symptoms when no moisture or mould problems were present, this is increased to 19.5% when even one moisture or mould symptom was noted.

The evidence points to a direct relationship between respiratory problems and the home environment. Simply put, exposure to moulds is not good for us. Moulds need moisture and warm temperatures to grow. These are more likely to be found in moisture troubled houses.

Fortunately, moisture problems are readily preventable, often at a low cost.

Over time we have learned that what constitutes a moisture problem has changed. It used to be thought that interior mould was a result of sloppy housekeeping. Window condensation was thought to be due to too many boiled foods and drying of clothes indoors (so that occupants could fix the problem if they want to!). In other words the windows were OK but the people weren't!



We now know that some houses will self-destruct even if they are unoccupied (but heated). Even some building scientists are having severe moisture problems in their own homes (as are some housing officials who always used to blame the occupants), even when they do everything right according to the old way of looking at things.

Anytime condensation leaks or rain penetration causes more than very short term water deposits or even soggy materials, we have moisture problems. Builders know how to avoid leaks and rain penetrations. But what about condensation?

Anytime you can see or smell, or have reason to suspect mould, mildew, or other fungal growth (and that certainly includes mushrooms growing out of joists or carpets) you have a problem and should act to solve it.

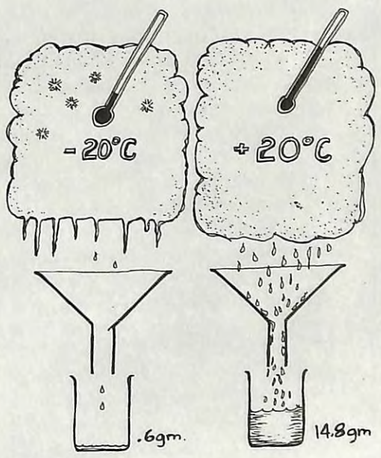
It is important to keep in mind that solutions are sensitive to local micro climate. What works in one area may not come close to being adequate in another area, sometimes less than an hour's drive away. This is especially the case in milder coastal areas. Codes, however, attempt to provide one common solution to what are many different problems.

Dew Point temperature & Relative humidity

To understand the moisture problems that often precede mould problems, we must understand a little bit about how water vapour is suspended in air, and when and why it comes out - in the form of condensation, or "dew".

At 20° C air can hold 14.8 grams of moisture for each kilogram of dry air. If it has that much, it is saturated or at 100% Relative humidity (RH).

Air at 15° C can hold only 10.7 grams per kg. of air. Thus air that is at 100% RH, when it is cooled from 20° C, must loose 4.1 grams of water for every kilogram of air, in the form of drops of moisture on cooler surfaces. If that air, saturated at 15° C is again warmed to 20° C, without picking up moisture, it would be at a Relative



Humidity of 72%

Very cold air cannot hold much moisture, a fact well known to those who live in the prairies and other cold regions. Air at -20° C is able to hold only .6 of a gram per kilogram of dry air. When warmed to +20° C, if it does not absorb moisture in the process, it would be at 4 % RH. That is why cold air brought indoors, by air leakage or ventilation systems is a good drying mechanism. With an air change rate of 0.3 AC/hr, a 500 cubic metre house (about 2200 sq. ft.) processes about 4300 kilograms of dry air, and could absorb about 16kilograms of water each day, as it comes up to 30% RH at 20° C.

Warmer indoor or outdoor air can hold more water vapour. At 25° C, it can hold 20.2grams/kilogram of air. If that air were cooled to 20° C, it would have to release 5.4 grams of water for each kilogram of air cooled.

If 30° C air at 80 % RH is brought indoors, and hits a cool surface at 15° C, it will release 11.1 grams of water for every kilogram of outdoor air brought into contact with a cool surface. Such muggy air can and does cause severe moisture problems in basements when they are ventilated in the summer. This is why basements are often so dank and wet in the summer, especially in the humid Ontario and Quebec summers.

During cooler weather, warm moist air leaking out past cold surfaces can drop moisture inside the building structure. That is the reason for our use of air barriers and our dislike of pressurized houses, which force indoor air out through the cracks and openings.

The reason that we do not see as many moisture problems as might be predicted are that most building materials are able to absorb a lot of moisture before they get into trouble. In addition, the heat lost in the exfiltrating (outgoing) air warms the surfaces it contacts, (if it is flowing quickly,) so that they may be warmed above the dew point temperature. At this point condensation stops. Long paths with slow-moving air flow are at risk.

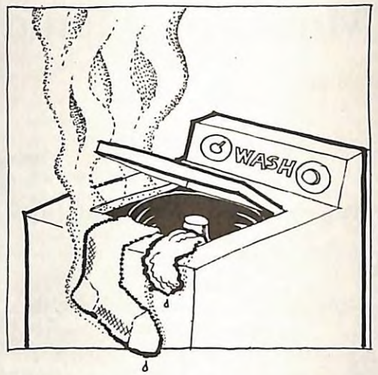
TABLE 1
CRITICAL OUTDOOR HUMIDITY CONDITIONS

Indoor Temp	Indoor RH	Critical Outdoor RH (%) at Outdoor temperatures 0°C	5°C	10°C	15°C	20°C	25°C
20°C	30%	*	82%	58%	41%	30%	22%
20°C	55%	*	*	*	76%	55%	40%
25°C	30%	*	*	*	56%	41%	30%
25°C	55%	*	*	*	*	75%	55%

* any outdoor RH is below the critical level and OK.

All conditions in a horizontal line have the same dew point temperature as the indoor air condition shown.

e.g. If it is 20°C at 30%RH inside, at a 15°C outdoor air temperature, only air that is dryer than 41% RH will help reduce indoor humidity levels. If there are indoor sources of moisture, then the outdoor air may have to be dryer.



Moisture sources

There are many moisture sources in a house. People are seldom the direct source of the majority of that moisture. A household of 2 adults and 2 children would likely generate about 5 litres from respiration and perspiration. All their activities would likely add another 5 litres. Tests done in several countries consistently show that many houses seem to release more that. Homes with moisture problems on average generate about 29 litres per day (and in extreme cases as much as 72 litres per day!).

The major source of moisture in problem houses is usually ground water moving into the building. This can be direct evaporation of moisture on unfinished soil floor in a crawlspace or basement or wicking through a concrete floor with no moisture barrier underneath it.

Air drawn into the house through the soil can hold more water vapour than cold outdoor air, since it is likely saturated at the soil temperature just outside the crack. In a basement with a soil temperature of 15° C, a vapour input rate of 1.1 kg per day would result from each 1 l/s of soil gas flow.

In new buildings, construction materials can contain hundreds of kilograms (often more than a tonne) of water that will be released during the first year. This can correspond to about 10 litres per day. The release of construction moisture in the first year is not generally a major problem. But if the moisture is still there several years after construction, it indicates a more fundamental problem.

If combustion gases spill indoors, they too can contribute to a moisture problem. Most fuels produce about one kilogram of water vapour for each kilogram of fuel burned, so that venting the combustion products indoors can add much moisture during a heating season. 1 litre of kerosene releases about 1 litre of water vapour. Natural gas and propane release even more water (per kg of fuel burned).

Sometimes people bring in green firewood, and cause serious condensation problems upstairs, as the wood dries in the basement. This can amount to tonnes of moisture.

Another example of the unique problems facing some homes near the coast, especially in Atlantic Canada is the super saturated air. It is normal to think that air at 100 % is holding all of the moisture that it c an hold. However, fog can hold much more than that amount of moisture, in the form of water droplets. The fog can cause problems when it contacts any cold surfaces, or is brought indoors.

Solving moisture problems is best done by reducing the sources. Relying on large ventilation flow rates to control moisture problems, is a not a good method in very moist climates.

Ventilation for humidity control

Ventilation can control indoor humidity problems when the outdoor air has significantly less water than the target indoor level. So when can ventilation be used to control humidity indoors?

The Canadian ''Guidelines for Residential Indoor Air Quality'' recommend a winter Relative Humidity range of 30% to 55%, unless otherwise constrained by excessive window condensation. Indoor air at 20° C and 30% RH holds 4.4 grams of water per kg. of dry air and has a dew point

KEEPING HOME OWNERS OUT OF TROUBLE.

The builder or renovator can do much to improve the ability of a dwelling to avoid moisture problems, but the householder has a great deal to do with how well a given house will actually do, in terms of moisture problems. Here are some of the recommendations that useholders should take to heart, to protect their health and the health of the dwelling:

1) buy and consult a good hygrometer (an instrument that indicates the Relative Humidity of the air). Unfortunately most hygrometers only promise an accuracy of + 5% which is not really good enough.
2) keep the indoor RH between 30% and 55% in the winter time (measured in the most populated bedroom, on an outside wall), and between 30% and 70% in the summer (measured in the basement)
3) avoid condensation on windows by keeping the RH lower than the recommended values above if necessary
4) keep fabrics and other materials (clothes in closets, curtains, stored materials) away from outside walls
5) use a dehumidifier, if necessary, to keep the basement down to acceptable levels if reducing moisture sources does not do the job
6) use an energy-efficient air conditioner to cool an dehumidify the whole house if it is hot and muggy both indoors and out
7) always keep humidifiers, dehumidifiers and air conditioner coils, drip pans and tanks scrupulously clean, by scrubbing well and by using safer fungicides such as washing soda
8) disconnect, clean (and remove, if possible) any humidifiers not needed to keep the Relative Humidity up to 30%
9) never vent clothes dryers indoors, as they are a source of excessive moisture, harmful chemicals, and troublesome dust (no commonly-used filter removes the small particles that do the most damage to lungs)
10) mop up spills and wet floors quickly if indoor RH is much above 30% to avoid adding to the moisture load that ventilation must absorb
11) be cautious about extra ventilation when it is hot and muggy outside, especially into cooler areas like basements, as the outdoor moisture may condense inside, resulting in an unnecessary moisture and mould problem - use one of the energy-efficient air conditioners instead
12) avoid releasing more moisture into the indoor air than is necessary, by using bathroom fans and kitchen range hoods when necessary
13) keep surfaces clean, especially those that sometimes get wet
14) if surfaces or materials do get mouldy, remove the mould and mildew quickly, using washing soda or vinegar for mild cases, and Chlorine bleach, with adequate ventilation, forsevere or stubborn cases
15) don't reduce ventilation to "save energy", if you have any moisture or mould problems, at least until you deal with major sources.

temperature of about 3° C.

At 55% RH, the moisture content of 20° C indoor air is 8.1 g/kg, and outdoor air holding more than that has no drying effect.

At or below 0° C, any outside air has a drying effect. As outside air becomes warmer, it can hold much more moisture - to the point it can't do any drying. The critical outdoorhumidity conditions for drying by ventilation are noted in Table 1.

Jim White is a senior advisor (building science), Research Division, CMHC This article is based on a paper presented at ENERhouse '91, a conference on Energy and housing in Halifax N.S., March 5,

Crawl Space Ventilation & Moisture Control

Crawl space foundations are common in B.C., although they are not unknown in other parts of the country. A range of problems are associated with crawl spaces.

Codes require vents for crawl spaces. Despite this some crawl spaces have high moisture levels. In some cases, the moisture moves into the living area which leads to high humidity levels and condensation in living areas. Crawl space vents are also a major source of house heat loss especially if the crawl space contains forced air heating ducts or supplementary heating.

Moisture in crawl spaces often is the result of poor construction techniques. Crawl spaces don't get adequate inspections and there is a general lack of appreciation on the part of the housing industry for the components of an effective moisture control strategy. Recent research reports have indicated that alternative crawl space construction techniques may be warranted, and that passive ventilation may often be unnecessary or ineffectual.

A surprising range of problems are being encountered and there are difficulties with Code interpretation. The meaning of a "warm air plenum" is not clear. In some municipalities builders are required to install exterior wall vents, even when the crawl space is heated by return and supply openings from the forced air ducts in the crawl space. In the Victoria area, some inspectors insist that baseboard heaters be installed and operated in the crawlspace.

Summer Ventilation

The principal reason for putting vents in a heated crawl space is to ensure adequate drying during the non-heating season. Unfortunately most home owners are not aware that vents are to be opened in the spring and closed in the fall. Vents are often inoperable because sunlight has distorted them or they have been installed poorly. Near the ground air moves slowly, so air movement through passive vents in summer may supply very little drying potential. It may actually contribute to condensation in the crawl space.

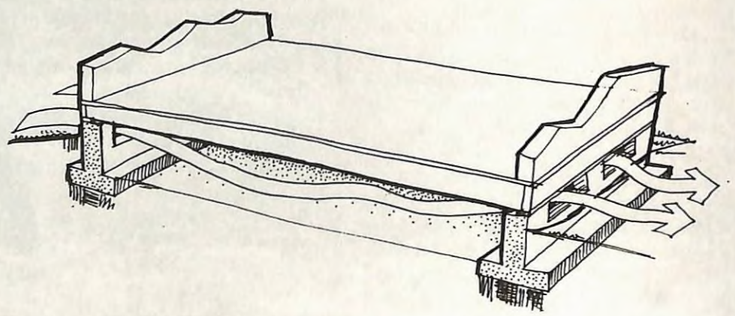
Winter Moisture Problems

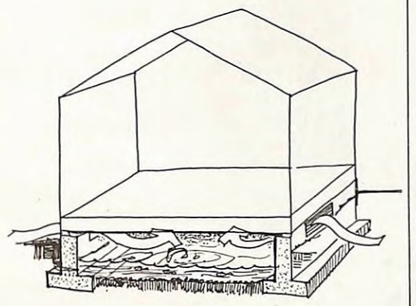
The most common reason for moisture problems in new houses (aside from occupant lifestyle) is moisture loading from crawl spaces. Factors that can contribute moisture include poor site drainage, poor (or no) moisture barriers and wet soil.

Winter heat losses

In houses with forced air heating, crawl space vents (which are almost always left open) often work like warm air registers, moving warm air to the outside. These vents are the single most important reason for excess air leakage and heat loss from B.C. houses, and represent a serious design flaw in new housing stock. Not surprisingly, some air sealing crews working on new R-2000 houses have been permanently sealing the vents from the inside with foam board blocks and sealant, leaving a tight crawl space with only the appearance of ventilation.

Passive vents in crawl spaces do not guarantee ventilation. The vents are close to the ground, so they are well sheltered from winds. A California study indicates that most of the air entering these vents will get into the living areas, presumably taking moisture and soil gases from the crawl space on its way through. Even in an unheated crawl space, with a sealed first floor, the drying performance of such vents is questionable. In coastal B.C., exterior air in winter contains much moisture, and has little drying capacity.





The recent trend towards non forced air heating in tighter houses could lead to more moisture problems if poor construction practices persist. Recently there have been reports of moisture problems in attics that can be traced directly to humid crawl space air rising through by-passes in the house construction into the attic.

A study in Vancouver is under way for CMHC by Sheltair Scientific. The objectives are to investigate the extent of problems with heat, moisture, air and soil gas flows in crawl spaces in B.C. houses; to identify construction trends that may impact on the effectiveness of current and proposed crawl space moisture control strategies; and to develop, demonstrate and describe new ventilation and moisture control strategies for crawl spaces that are likely to be convenient and economical for both builders and householders over the foreseeable future, and that are suitable for incorporation into the building code.

The study is in progress. We will let our readers know the results when they are ready.

Letter to the Editor

Sir,

Re: CSA Ventilation Standard F326; Solplan Review No. 37

Let me compliment you on your timely and well written article concerning the standard. Now that it is finally published, it's nice to see the word go out.

While your write up was in general very accurate and comprehensive, there are somepoints of error or omission. In the interests of clarity I would like to point out some specificdetails.

1. CSA F326 does replace C444 (Installation Requirements for Heat Recovery Ventilators),and C444 will cease to be published in keeping with CSA's policy of rationalizing standardswhere possible.

2. If distribution is provided through a system that recirculates air between rooms (and is capable of continuous operation), the minimum amount of air that must be supplied to a room for it to be considered "ventilated" is: 20 l/s for master bedrooms and basements; 10 l/s for other *category A* rooms; 5 l/s for *category B* rooms;

This airstream does not have to contain outside air directly in it. *If outside air is entrained directly in this airstream,* (e.g. to a return-air intake) then the above quantities may be reduced by the actual amount of outdoor air contained in the air being supplied. It should also be noted that *category A* rooms are allowed to be "ventilated" by removing air (to be exhausted or *recirculated).* The withdrawal quantities are the same as those cited above, ie; twice the amount of outside air that would otherwise have to be directly supplied to the room.

I consider this point an important distinction because it allows a small volume recirculation system (40-50 l/s in a small bungalow) to provide the required distribution, without the need to introduce the ventilation air directly into this airstream. Ventilation might in some cases occur through induced infiltration (in an exhaust type system) or a combination of infiltration and intentional openings (such as inlet-slots). It also allows innovative "cost effective" ventilation systems such as the one suggested by Allen Associates in which air is "withdrawn" from the living areas and supplied to the *category B* rooms from which it is exhausted. In an exhaust-only inlet-slot type system, this provides the assurance of distribution which would otherwise be lacking.

3. Air below 12°C is not allowed to be supplied to *any ducted heating device* (not just fuel-fired appliances) unless designated for such use by the manufacturer. There is a probability of condensation forming on cabinet parts at these low temperatures so the condensation could be a hazard if electrical parts are wetted.

4. According to the studies with which I am familiar, high humidity levels also lead to higher levels of bacteria and viruses. Fungal growth is promoted by higher humidity and can be linked to allergic reactions in some individuals. One of the most common allergies (dust mites) is mitigated by dry conditions (the dust mites love humidity). Of course, the mucous membrane aggravation that occurs at lower humidity levels is uncomfortable and tends to aggravate existing respiratory ailments.

In truth, a balance is required and the need for control systems is appropriate. It is not appropriate, however, to fall into the old "ventilate according to humidity level" argument. In lightly occupied homes, chemical pollutants such as formaldehyde may become higher than desirable if ventilation is restricted to "only control humidity". In such dryer homes, persons armed with the "ventilate for humidity" rationale might be led to turn off their ventilation system at night for example, and deny themselves the benefits of sleeping-room CO_2 reduction. The bottom line is that depending on the occupancy pattern of the house, humidification may be required to provide optimum comfort conditions.

I hope that you will consider these comments as my contribution to your already excellent reporting on this subject.

On another level, I would like to discuss your commentary on the standard.

Of course the standard is too complex for the average practitioner. However, the position that it is too complex for the *industry* is perhaps extreme. One of the reasons that the standard is longer than most is that it has a lot of detailed material intended to assist and clarify the application of the standard. It may not be readily understandable by some readers as it contains performance requirements which are as broad as possible. This does not mean that it is complex. The document is not a "Manual of Practice" and refers users to such manuals for guidance in applying the standard.

Happily, most of us will never have to wade through the standard because HRAI national has been devoting a considerable amount of effort updating their training course and manual (which was based on the preliminary draft) to the final standard. Personally, I am proud to see the way HRAI has responded to the changes in the ventilation industry by actively developing the necessary training materials and delivery system.

Updated courses have just begun to be delivered and include material on the building code requirements as well. The 2-day course being offered this spring is targeted to installation personnel (although some basic design material is included). A design-oriented course suitable for all persons who are involved in residential ventilation including inspection authorities is also in the works.

The issue here is a chicken and egg problem. Jurisdictions will be hesitant to implement the standard if trained and competent installation forces are not available; installation personnel and training organizations will be hesitant to invest in training unless implementation is clearly imminent. It is nice to see (for a change) an organization such as HRAI attempting to break out of this cycle by providing quality training as soon as possible.

The R-2000 program is in the process of adopting the F326 standard. It is important to note that systems installed in R-2000 homes are not necessarily those that would be installed in all homes if F326 was universally mandatory. (The primary difference being that R-2000 systems are likely to have heat recovery).

The main arguments against implementing ventilation standards are of excessive cost. Until it becomes clear that F326 will be applied to more than just R-2000 homes I do not think there will be a great rush to develop more cost-effective and appropriate "entry level" ventilation systems. This is unfortunate as it says: "those that can afford to have good air quality can have it and those that can't afford to have good air quality won't". Apparently no one has yet asked what the cost of inadequate ventilation is. The health costs of poor ventilation are shared by everyone and the damage that occurs to the building because of inadequate ventilation is a cost that those of modest means cannot well afford.

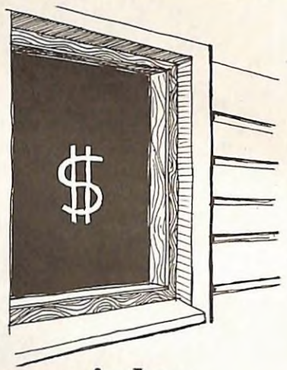
The way I see it, there is a strong social basis for ensuring that houses be equipped with systems that allow occupants to provide themselves with at least the basic ventilation required for health. At least as important is the need to provide some order to the interaction of household appliances which may result in backspillage. The implementation of F326 on a wider basis is therefore a desirable objective for the building industry and I am glad to see organizations such as yours and HRAI take concrete steps towards this goal.

Dara G Bowser MAATO
Building Technologist
Associate member, CSA Committee on Residential Mechanical Ventilation
Instructor, HRAI Residential Ventilation

Coloured Window Spacers

The first non-metallic window spacers on the market (a butyl rubber type, such as Tremco's swiggle strip) were black. For many, the aesthetics were a problem as black is black is black. Today there's a strong demand for colour.

The Super Spacer™ foam spacer has taken up the challenge and now has introduced its first line of coloured spacers. An architectural bronze colour formulated to match the colour in bronze-metal extrusions is now available. Other colours will be made available in the future.



Super window incentive

Ontario Hydro has announced a $5.00/sq.ft. rebate program for high-performance windows in electrically-heated homes.

The program will provide consumer rebates on all factory-assembled vertical windows and sliding-glass-doors that achieve high enough energy ratings to make it onto an approved product list (The energy-rating process is being finalized).

Installations must be performed by contractors registered with Hydro's EnerMark program. Approved product lists will also be available from Ontario Hydro.

B.C. Energy Efficiency Standards for Appliances

B.C. has joined Ontario in establishing minimum energy efficiency standards for household appliances.

All appliances manufactured after May 1, 1991 must meet the new standards. Appliances covered include: ranges, clothes washers, clothes dryers, 175 and 275 litre electric water tanks, refrigerators, gas furnaces, and gas ranges.

Room air conditioners (up to 10.55 kilowatts) must meet new standards Sept. 1, 1991 .

All electric water tanks (50 l to 450 l), central air conditioners and heat pumps rated below 19 kw must meet the new standard Jan. 1, 1992

All products will be labelled by the manufacturer to show they meet the minimum standard.

Canada Post: the saga continues.

This may begin to sound like one of those never ending soap operas. Fortunately, the and appears in sight.

The story so far: Readers may have noted that we have had our run-in with the Canada Post. Aside from outrageous rate increases, our postal office has been restructured and service cut.

Over 800 customers were threatened with eviction as postal box service was to be terminated in the interests of "service improvements". Long term customers were told to get lost - find some other place to collect their mail.

Needless to say this caused considerable uproar. We have now learned that after further consideration, some sanity has prevailed. Canada Post will install new boxes for business users only, to meet the obvious demand, at a new fee structure that represents a 118% price increase. I guess they haven't heard about the anti-inflationary polices promoted by the Bank of Canada and the federal government. Seemingly they are unaccountable to anyone, so I guess they figure they can do whatever they want, and never mind about the public.

The good news is that they have decided that maybe after all it won't be too difficult to relabel the new boxes with the old numbers so that those who retain their boxes won't have to change addresses. This means that we will be able to retain our postal address.

Hopefully, this is the end of the saga. It should be considered a farce were it not such a serious issue.

Richard Kadulski

Don't miss out!

Stay informed about the latest developments in building technology. If you are not yet a subscriber to SOLPLAN REVIEW, do it TODAY!

Don't be left out in the cold!

You can FAX your order: (604) 689-1841

solplan review
the independent newsletter of energy conservation, building science & construction practice

SUBSCRIBE TODAY!

SOLPLAN REVIEW is an independent Canadian newsletter published 6 times per year to provide news, technical details, new product information, insights and commentary on developments covering all aspects of building science and energy efficient building practice for new and retrofit residential construction.

SOLPLAN REVIEW serves the needs of professional and interested lay persons. Technical information is presented in a clear, concise manner, without resorting to jargon.

As an independent subscription supported publication, we rely on the support of our readers. If you are seeing this publication for the first time, and find it valuable, why not ensure you don't miss any copies. Subscribe today!

YES, I WANT TO SUBSCRIBE TO **SOLPLAN REVIEW**
In Canada: 1 year: $38.52 ($36.00 + 2.52 GST)
2 years: 72.76 ($68.00 + 4.76 GST)
USA and other foreign:
1 year: $ 43.00 per year
2 years: 82.00
(u.s.a. and other foreign in u.s. funds).

payment enclosed please bill us P.O. #_____

please charge to credit card:

VISA MASTERCARD AMERICAN EXPRESS

card number: _____ expiry date:_____

signature: _____

name: _____

address: _____

_____ post code: _____

the drawing-room graphic services ltd.
box 86627 north vancouver, b.c. V7L 4L2

THE BOOKSHELF

A selection of books that will be of interest to our readers. Price and availability subject to change without notice.
All orders shipped by bookpost. Please add $0.75 per book for postage and handling ($2.50 max. per order);
outside Canada: $1.50 per book ($5.00 max. per order).
CANADIAN ORDERS PLEASE DON'T FORGET TO ADD 7% GST

TIPS & TECHNIQUES FOR BUILDERS from Fine Homebuilding. A handy paperback reference on tools, layout & measuring, foundations, rough carpentry, roofs, floors, drywall, trim, built-ins and more.
$ 12.95

CHEMICAL ALLERGIES
by Dr. Richard Mackarness. Discusses the impact of chemicals used in food and household products on humans. $9.95

RADON: The Invisible Threat
by Michael Lafavore. Radon is a colorless, odorless and tasteless radioactive gas that gets into houses. RADON defines what it is, where it is, how it can contaminate a house, practical steps to overcome the problem in new construction or in existing homes. $15.95

SOLPLAN 6: An Air Exchanger for Energy Efficient Well Sealed Houses
A do-it-yourself manual for building a heat recovery ventilator; developed by the pioneers of low energy building technology at the University of Saskatchewan. $6.95

1991 CONSUMER GUIDE TO HOME ENERGY SAVINGS
Listings of the Most Efficient Products You can Buy and much more. Contains information on how to get the most benefit from the new household equipment. Includes product listings (by make and model number) and performance ratings for household mechanical equipment and appliances. $8.35

YOUR HOME, YOUR HEALTH, AND WELL BEING
by David Rousseau, W.J. Rea, Jean Enwright. What you can do to design or renovate your house or apartment to be free of outdoor and indoor pollution. By knowing what pollutants affect our homes, and applying carefully explained step-by-step solution, dwelling can be transformed into healthy, quiet clean pleasant places. A special detailed section gives recommendations for those with environmental sensitivities.
$19.95

THE COMPACT HOUSE BOOK: 33 Prize Winning Designs - 1,000 sq.ft. or Less
Don Metz, editor; The designs presented were winners of a Garden Way Compact House Design Competition. Shows a range of designs stressing low energy, modest cost, & how small houses can be imaginative & comfortable living spaces $19.95

FINE HOMEBUILDING ON FLOORS, WALLS AND STAIRS
31 articles from Fine Homebuilding magazine compiled into this illustrated book that covers designing and building stairs; staircase renovation; preparing and finishing walls; ornamental plaster & raised panel wainscoting.
$16.95

FINE HOMEBUILDING ON BATHS AND KITCHENS
Reprints of some of the best stories from Fine Homebuilding on the most popular renovation projects. Expanding kitchens; European style kitchen cabinetry; remodelling a bath; and much more. $16.95

THE TIMBER FRAME HOME Design, Construction, Finishing. by Ted Benson
The age old craft of timber framing has gained new life in recent years. This illustrated book covers the fundamentals of the craft and the range of design and structural options available.
$24.95

WINTERGREENS: Solar Greenhouses for Cold Climates by Mark Craft
The complete guide to building and operating a greenhouse in cold climates. This book examines all aspects of theory, design and construction, with special emphasis on attached greenhouses.
$12.95

CLASSIFIED

FIREPLACE DAMPERS
Winter is with us still. If you have an old masonry fireplace that is seldom used, and find that it only keeps the room cold, here's your opportunity to reclaim the room. The **Davic Heatsaver** is an inflatable damper that fits most fireplace dampers like a snug pillow. It reduces down drafts through the fireplace, and reduces energy losses up the flue. It'll pay for itself in the first year.
Only $36.00 (plus $2.50 for postage & handling)

the drawing-room graphic services ltd.
box 86627 north vancouver, b.c. V7L 4L2

WANTED Advertisements for products or services that would be of interest to SOLPLAN REVIEW readers. Reach over 4,500 members of the Canadian home building industry through a classified add in SOLPLAN REVIEW. Contact us for details. box 86627 north vancouver, b.c. V7L 4L2. FAX (604) 689-1841

Please circle items you wish to order. Total $_____
Please charge to credit card:
VISA MASTERCARD AMERICAN EXPRESS

Card NO. expiry _____ _____
signature _____
NAME: _____
ADDRESS: _____
_____ POST CODE_____

the drawing-room graphics services ltd.
box 86627 north vancouver, b.c. V7L 4L2

CALENDAR

Solar Home Program - Sept. to May, 'how-to and 'hands-on' series of Workshops on solar home design and construction. Contact: Solar Technology Institute of Colorado, P.O. Box 1115, Carbondale, CO. 81623 Tel: (303) 963-0715

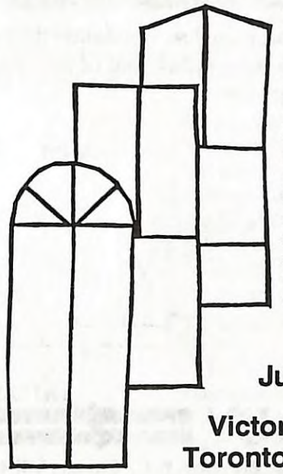
MECHANICAL COURSES Over 130 courses for mechanical trades are being offered across Canada in the following subject areas: Handling of CFCs/HCFC's; Business Management Residential and Small Commercial Heating & Load Calculations and Air Systems Design; Residential Mechanical Ventilation Installation

Other courses available based upon regional needs: For course descriptions, dates, locations & fees contact: HRAI, 5468 Dundas St. W Suite 308, Etobicoke, ON M9B 6E3 Tel 416-239-8191 Fax 416-239-1983

The Conference on Energy & Environment, The Next Generation. 17th annual conference of the Solar Energy Society of Canada. **June 23-26, 1991**, Toronto, Ont. Includes energy conservation, solar shelter workshop, windows, and more. Information: SESCI Tel. 613-236-4594

Timber Framing workshop July 16-20, 1991 Hand-ons session will include raising a timber frame for a building to be donated to the Village of Grand Rapids, Ohio. Details: Northern Timber Framing, Grand Rapids, Ohio Tel 419-832-1616.

HIGH PERFORMANCE WINDOWS WORKSHOP



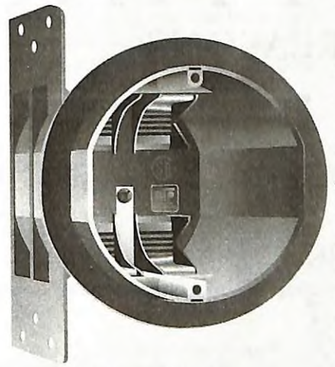
This one-day workshop for architects, builders, building engineers, designers and students will explain how new window technologies affect building design and provide participants with an overview of new window products and design tools including: Frame 2.1, Vision 2.0, & the new Win-2000.

Cost $85
June 27, 1991
Victoria College
Toronto, Ontario

High Performance Windows is offered as a public service by the Solar Energy Society of Canada as part of its 17th annual conference.

For information: 3-15 York St., Ottawa, ON K1N 5S7
tel. 613/236-4594 fax. 613/236-5053

Airtight electrical boxes



* Builder friendly
* Energy efficient - reduces heat loss
* 2 hour fire rated
* Made from G.E. Noryl™ non toxic plastic for strength and flexibility
* Nailing flange for easy installation - no need to measure for ½" drywall
* Labour saving installation

Model F-WOCT

* Large capacity box
* Internal screw bosses for all devices
* Easy access to bottom mounted ground screw
* Hinged cable entry tabs
* Single, double, and octagonal boxes
* Drywallers only screw board on each side of the flange to form an airtight finish
* CSA & UL approved

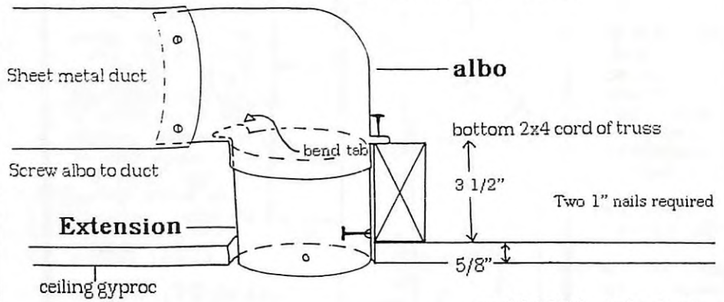
NU -TEK PLASTICS INC.

NU-TEK PLASTICS INC.
#25 - 11151 Horseshoe Way, Richmond, B.C. V7A 4S5
Tel: (604) 272-5550 Fax: (604) 272-5551
distributor enquiries welcomed

albo

Ceiling Application

The **albo extension** is used so ventilation duct can be installed above bottom 2x4 cord of attic truss.



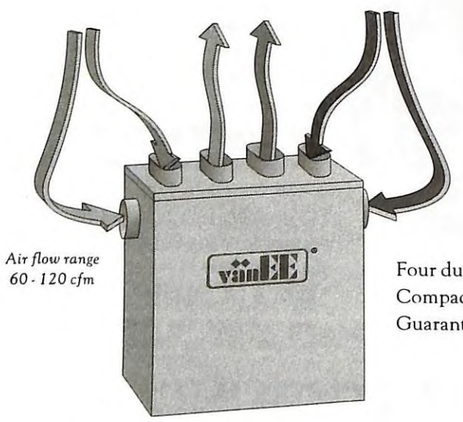
send SASE for info sheet

ENEREADY

6860 Antrim Avenue, Burnaby, B. C., Canada V5J 4M4

FRESH AIR

FOR ALL REASONS™



Introducing the NEW vanEE 1000 Convertible

Air flow range 60 - 120 cfm

Four ducting options
Compact size for easy handling
Guaranteed vanEE quality

Leading the Way in Ventilation Technology

vanEE®

CES INC. CAN 306 242·3663
3310 MILLAR AVE USA 800 667·3717
SASKATOON SK S7K 7G9 FAX 306 242·3484

HOT 2000

WHAT IS IT?

HOT2000 is an advanced approach to the design and modelling of energy efficient structures.

HOT2000 is an easy-to-use computer program designed to assist builders, architects and engineers design low-rise residential buildings. Utilizing current heat loss/gain and system performance models, the program aids in the simulation and design of buildings for thermal effectiveness, passive solar heating and the operation and performance of heating and cooling systems.

WHAT CAN IT DO FOR ME?

HOT2000 lets you input comprehensive data on proposed building design, analyze the expected heat loss/gain, and revise and test altered designed until a satisfactory design is achieved.

Contains extensive weather data, several models for HRV, foundation, water heating systems, and more.

HOW TO GET HOT2000

HOT2000 is available from the Canadian Home Builders Association (CHBA) in either a Canadian or U.S. version at the following prices:

- $120.00 (Cdn) for the Canadian version
- $150.00 (US) for the USA Version (contains US weather data)
- Price includes User and Reference Manuals

To order HOT2000, complete the attached form and send it with a cheque or money order to:

HOT2000 Sales
CHBA
Suite 702, 200 Elgin St.
Ottawa, Ont. K2P 1L5
Tel: (613) 230-3060

ORDER FORM

Please send me
_____copies of HOT2000 Canadian Version ($120.00 Cdn) per copy
_____copies of HOT2000 USA Version ($150.00 US) per copy
IBM Mac

My cheque money order in the amount of _____is enclosed. Make cheque Payable to Canadian Home Builders' Association

Name _____

Organization _____

Street Address _____

City, Prov/state _____

Postal/Zip code _____

Telephone No. _____

Lighting Options

When Thomas Edison invented the incandescent lamp it was a marvel of science and engineering. Today we are not able to live without artificial light. However, the incandescent lamp is very inefficient. Light output is low (compared to power consumption) and they generate a lot of heat (not desirable in the summer, an expensive heating system in winter).

The original incandescent lamp is still the most common type. Light is produced by passing a current through a tungsten filament contained in an evacuated glass bulb partially filled with an inert gas. Only 5 - 8% of the input energy results in light production; the rest is heat. Thus for many applications the incandescent lamp is not an efficient light source, even they are cheap, compact and a warm colour tone.

Major energy savings can be achieved by improving the energy efficiency of lighting. This is why utility energy conservation programs stress lighting efficiency. In the residential sector, this means greater use of compact florescent and halogen lights.

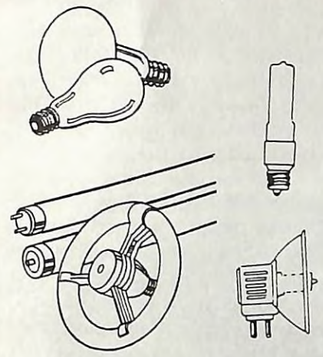
Colour Rendition

When you mention fluorescent, many people become uneasy. They are familiar with commercial and industrial fluorescent lighting installations that use limited spectrum fluorescent that do not deliver a balanced light spectrum (e.g. the cool whites).

Cool light sources provide a crispness to the environment and are often favoured for work areas. Warm light source, are often used at lower light levels in social or residential environments.

Light is modified by objects. The appearance of any object is determined by the mix and power of light waves that reach our eyes. Objects have a colour only because of the way they selectively reflect, transmit or otherwise modify various wavelengths of light.

Colour and colour renditions are as much functions of individual interpretation as they are functions of light sources. We are familiar with the colour effects of daylight, which emphasizes cool colours and with



the colour effects of incandescent filament lamps that accentuate warm colours. "True colours" and "true colour rendition" are subjective. The choice of which lamps to use for which situation always varies according to personal preferences.

A numbering system has been developed to show the amount of colour change or distortion objects undergo when illuminated by a light source as compared with the colour of those same objects when illuminated by a "standard" light source. It is known as the **Colour Rendering Index** or CRI. The closer to 100, the less colour distortion. The CRI for incandescent lamps is typically 97; fluorescent 55 - 95; high intensity discharge lamps 15 - 70. Most compact fluorescent lamps have a CRI of 81 - 82.

Colour Temperature

Another measure of light colour is the colour temperature. The wave length range of a light source is defined in terms of "colour temperature". Most materials give off light if heated to high temperatures. As the temperature is raised, the colour of the light will change. For example an iron bar appears dull red when heated, then red-orange, white, and finally blue-white as it is heated to a high temperature before it liquifies. In the same way, the tungsten filament in an incandescent lamp changes colour when different voltages are applied.

The colour temperature is expressed in units called "kelvin" (°K). The higher the K number, the colder (or bluer) the light; the lower the K number, the warmer (or yellower) the light. Tungsten filament incandescent lamps have colour temperatures in the 2550°K to 2900°K range. Most compact fluorescent lamps are about 2700 °K. Standard cool white fluorescent lamps used commercially are in the 4100 -4300 °K range.

In addition to affecting perceptions and emotions the colour of light can also affect the subjective interpretation of brightness. Experiments have found that for each colour temperature there is a maximum and a minimum agreeable general brightness. If the level is too high, surface colours will seem faded and unnatural; if it is too low, the space will appear dim. "Warmer" light is more acceptable at lower levels.

Efficiency

You can find out which lamp is most efficient by comparing the lumen output of different lamps with the power they consume. This is summarized in tables under "initial lumens per watt". (Lumens are a measure of light available from a lamp or luminaire).

Lamp life: is rated by the number of hours for 50% of an average batch of lamps to burn out.

Alternate Lamp Types

Tungsten-halogen

A tungsten-halogen lamp is an incandescent lamp with gases from the halogen family sealed into the lamp. The gas combines with the tungsten molecules that sputter off the filament, depositing the tungsten back onto the filament rather than on the bulb wall. This keeps the inside of the bulb clean and allows the lamp to deliver its initial light output throughout its life.

Although tungsten-halogen lamps aren't the most energy efficient or long lasting they do have some advantages. The colour is excellent. It gives off a whiter light than conventional incandescent with a continuous spectrum that renders all colours well. Luminaries are small and lightweight with precise light control. They have no ballast and are easy to install. No warm-up or waiting is required after a power interruption and they are suitable for use outdoors and indoors.

Tungsten-halogen lamps operate at a high temperature and at a high internal gas pressure. Under these conditions, a lamp may shatter. Some can also emit some ultraviolet radiation. A protective shield, screening technique, or both must by used with the luminaire to protect people and surroundings from both hazards. (To ensure safety, always read and observe the information in the manufacturers' caution notice).

Fluorescent

Fluorescent lamps come in many forms: Linear, U-shaped, compact or circular. The compact fluorescent are available in two or four-tube varieties. Fluorescent lamps use a tubular discharge lamp containing small amounts of mercury and the fill gas argon. The lamp tube is coated on the inside with phosphor. The UV radiation is converted to visible light by the phosphor crystals. The lamp brightness is comparatively low, but so is the potential for discomfort and glare. A ballast is needed for starting and to sustain operation.

Some people are bothered by a perceptible flicker in the standard 4' fluorescent tube. Compact fluorescent generally use electronic ballasts and do not seem to be subject to the same problem.

The Power Factor

Compact fluorescent, as all electro magnetic devices, require special design considerations. Electro magnetic devices can draw much more power than that detected by electric meters. The term used for this phenomenon is the power factor. This is the ratio of real power used to total power measured. Typically this affects electric motors and fluorescent ballasts.

Commercial electric rate structures take power factors into account, and apply surcharges where low efficiency equipment is used. Power factors below 80% are not unheard of (i.e. only 80% or less is actually used and detected by standard electric meters). This obviously becomes a problem - not only because there is power consumption not recorded by meters but extra supply capacity must be provided by the utility.

I have heard some utility reps question the value of using fluorescent because of the impact of the power factor. Fortunately, if the situation is understood it can be corrected easily by the use of a simple capacitor that corrects the uncontrolled power draw.

When B.C. Hydro launched it's Power Smart lighting programs (which provide incentives and rebates for compact fluorescent lamps and fixtures), they encouraged manufacturers of compact fluorescent light fixtures to make them high power factor. Even allowing for a loss of 5-6%, the increased light output per watt justifies the use of these fixtures wherever appropriate.

CHARACTERISTICS OF LAMP SOURCES

	INCANDESCENT	COMPACT FLUORESCENT	STANDARD FLUORESCENT (40 W LAMP)	HALOGEN
Efficiency (lumens/watt)	10-14	40-60	59	21
Rated life (hours)	1,000	10,000	20,000	2,000
Colour temperature	2,650 K 2,870	2,7000 K	4,3000 K	3,000 K
CRI	97	81-82	62	98
Colour	warm	cool-warm	cool white	

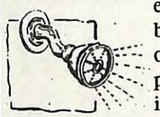
The U.S. Environmental Protection Agency has determined that environmental tobacco smoke causes cancer.

This means that indoor tobacco smoke may be regulated as a work place hazard. This may mean new U.S. regulations on indoor air quality standards.

ECOLOGO Guidelines

New guide lines have been developed to cover **energy efficient lamps** (such as compact fluorescent) and **water conserving products**. To qualify, water conserving showerheads must have a maximum flow rate of less than 9.5 litres per minute; toilets must use 6 litres or less per flush.

Other products of interest to builders for which ecologo guidelines have been prepared include cellulose insulation, HRV's, and solvent based paint. Draft guidelines awaiting final approval will cover energy efficient major appliances.



The ecologo program was developed to help consumers identify products that have a smaller impact on the environment that others in the same product category. To qualify and be able to use the symbol products must meet requirements specific to a product.

Technical Research Committee News

Canadian Home Builders' Association

Changes to R-2000 Ventilation Standards

CHBA is proposing to make CSA F326 (Residential Mechanical Ventilation Standard) the R-2000 ventilation requirement. There are 3 important differences between the current R-2000 requirements and CSA F326.

1. F326 sets a minimum air change rate of .3 ACH or 5 l/s (10 cfm) per room (whichever is greater). Currently R-2000 would allow a lower air change rate if the room by room calculation results in a lower number.

2. F326 deals with recirculation of air in the house, and allows it to be taken into account. This should not be a concern for R-2000 houses using HRVs.

3. F326 changes the allowable house pressure imbalance levels. If a house has a fireplace or wood stove the lower limit for allowable depressurization under F326 and R-2000 will now be 5 Pa.

Based on R-2000 experience for both continuous and intermittent ventilation this limit may be too strict for use with induced draft and power vented appliances. Thus with continuous ventilation, R-2000 technical staff is recommending maintaining the current level of 10 Pa and 20 Pa pressure imbalance limits for intermittent use. In the case of homes that are all electric or have sealed combustion there will be no upper limit for intermittent use of the ventilation system.

The management committee will be reviewing the proposed changes in May. The implementation date for changes is expected to be in early summer, after due notice has been given.

HVI Certification of HRVs

Beginning April 1st, all HRVs eligible for use in the R-2000 Program must be listed as part of the Home Ventilation Directory, produced by the Home Ventilating Institute in the U.S. The directory will be updated every six months.

Tests are done in accordance with the CSA Standard Method for test rating of HRVs. The only certified testing facility is Ortech (in Toronto).

Saskatchewan Flooring Survey Update

The Saskatchewan Research Council is conducting a floor system survey on behalf of the Saskatchewan Home Builders Association. The purpose is to determine the nature of subfloor problems that have been noted in recent years. Anybody who receives the survey is asked to complete it as soon as possible.

Ventilation Task Force

Due to the tremendous concern about the impact of new mandated ventilation standards, TRC has established a Ventilation task force. One of the main objectives of this task group is to provide background information for a policy statement to be developed by CHBA. It is hoped that a draft of this paper will be ready for the May TRC meeting in Montreal.

The possibility of detailing simple systems that are both practical and meet the requirements of the CSA F326 standard are also being investigated. The major concern is not that CSA F326 is a bad standard, but rather that it needs to be presented in a more understandable and simpler format. It may also be a good idea to further pursue simple and prescriptive ventilation systems. One interesting solution to present concerns may be a revised ventilation requirement that can be prescriptive and easily understood by the builder.

Another concern is that codes cannot mandate the use of ventilation systems. Appropriate guidance for the home owner how to use their ventilation system is a major gap. A document that can provide information on the maintenance and operation of these systems must be developed. Currently home owners don't even change furnace filters, so how do we deal with the maintenance of a subtle, perhaps more complex system?

There are indications that where use of ventilation equipment such as exhaust fans is optional usage is low. If the system is automatic or continuous (such as HRVs), usage time is quite high. This suggests that systems must be relatively maintenance free.

We do not have much information on the in-service record of ventilating systems other than HRV's or some central exhaust fan systems. It appears that recently a manufacturer tested bath and kitchen fans and found that when run continuously, they consistently failed within 4-6 months. Equipment quality is another area to be pursued.

Building Codes

The National Building Code of Canada (NBCC) is updated every 5 years. Once updated, it is the model code used in most parts of Canada. The 1990 edition is now going through provincial adoption process. The present status is as follows:

B.C.: the public review process for the adoption of code changes is now under way. The 1990 NBCC is the base code. Adoption, with some changes, should be late this year.

Alberta: the 1991 Alberta Building Code is complete and resembles the 1990 NBCC.

Manitoba: will be using the 1990 NBCC but will include an addendum addressing additional provincial requirements.

Ontario: have adopted and are using a version similar to the 1990 NBCC.

Quebec: have not yet adopted the 1990 building code as there was a problem with translation errors.

Newfoundland: 1990 NBCC is being reviewed. (Some inspectors are referring to it already).

Performance Building Codes

There is a continuing debate whether or not the building code should be prescriptive (i.e. the cook-book recipe: just follow the steps laid out) or performance standard (i.e. flexible: you determine how you wish to build, as long as it meets certain standards of health and safety and performance).

A study of performance building codes is now in a draft stage. It shows the current NBCC is actually a mixture of performance and prescriptive requirements. This approach does not appear to have been stifling innovation in the industry. Internationally, other codes follow similar patterns.

Materials emissions standards

A formal task group has been set up to look at emissions from materials. There is a need for this initiative as builders are trying to respond to increasing market demands for clean building products, but essential information is not available.

Materials emissions standards might at some time in the future be reflected in both the Building Code and material standards. This would assist the builder in the selection of materials over the long term. It is already happening in some parts of the world.

One study is already under way looking at particleboard emissions.

Repackaged HRV's

The development of heat recovery ventilator equipment continues. Quebec based **Venmar Ventilation** has repackaged their HRV products, that are being marketed under the **FLAIR** name.

New package shapes have been added, so that there is more choice available when selecting a location for the ventilator. In addition to the horizontal box shape, where ducts are fitted at either end, they also have furnace-like vertical units with all ports on the top of the cabinet.

Advanced Concept Houses

The first advanced house was built in Brampton, Ontario. The public demonstration phase was completed this March. It was a project to demonstrate the potential of new technologies, especially new high performance windows and integrated mechanical systems that were not quite on the market at the time the project was initiated.

The results are still being analyzed, but the project exceeded the expectations of the major sponsors: Energy Mines Resources field trials of new concepts, products, and technologies. ciency and environmentally friendly building processes and materials (in other words: ''Green Home''). It would also provide technical information for future evolution of the R-2000 standard in response to advances in housing technology and emerging environmental concerns.

A preliminary meeting was held in Toronto, April 15-16, sponsored by CHBA's TRC and Energy Mines Resources Canada. The meeting discussed ways such advanced concept homes could be built, and the kind of minimum technical requirements the homes should meet. Representatives of provincial home builders associations, utilities, and other agencies with an interest in housing were at the meeting. The response to the proposal was much stronger than anticipated.

While the details are still to be worked out, the TRC will likely play a key role in coordinating the various participants. The funding of the projects will come from a variety of sources. It is likely to come from EMR's CANMET (Canada Centre for Mineral and Energy Technology), provincial energy and environment ministries, industry associations and major corporations.

This program promises to continue the leadership Canada has established in low rise housing technology, through the basic research that was done at the Division of Building Research at the National Research Council (before it was shut down), carried on in the Mark demonstration houses sponsored by CHBA, the Saskatchewan Conservation House (which was the forerunner of the R-2000 program) and the Advanced House.How will the Advanced Concept houses be different? The intent is to allow flexibility in the selection of design and components.

Preliminary technical requirements being discussed include an energy consumption at least 50% below the present R-2000 standard. As the current formula used to calculate energy consumption has a bias for larger volume homes, a surface to volume factor would be added to the calculation. The suggested air tightness for the building envelope is also reduced by half (i.e. to 0.75 ACH @ 50 Pa or an NLA no greater than 0.35 cm^2/m^2).In addition, special emphasis would be placed on energy consumption for lighting and appliances.

For example, for refrigerators an energy consumption of 2 kwh/month per cubic foot of capacity is being suggested. This is equivalent to an Energuide rating of 20 kwh per month. Similar stringent requirements are being suggested for other appliances.

Some of these are not yet on the market, but they are technically feasible, so the project would offer manufacturers the opportunity to develop new equipment prototypes for testing and demonstration.We will be keeping a close watch on developments with this project, and readers will be kept fully informed as developments happen.

design & consulting
energy efficient building
consulting services
Quality Plus/R2000
design evaluations
HOT2000 analysis

Richard Kadulski Architect

208 - 1280 Seymour St,
Vancouver, B.C. V6B 3N9
Tel. (604) 689-1841

Low Energy Houses: How Does Canada Measure Up?

Judith Ramsay

The design of innovative homes to use the latest in solar and energy efficient materials and concepts is not happening just in Canada, but around the world.

To coordinate activities, and share in the findings, a working group of has been established by the International Energy Agency (IEA). It was formed in the mid 1970's by 18 member countries of the Organization of Economic Cooperation and Development to implement a program of cooperation in energy research, development and demonstration. Energy Mines & Resources is Canada's representative on the IEA.

The solar heating and cooling program has established 15 projects or tasks. Task 13 is Advanced Solar Low Energy Buildings.

Each country is working on a low energy demonstration dwelling. The Advanced House in Brampton is Canada's project. It had been underway when the international effort started, so the Canadian project is very much in the lead.

Norway is working on a row house concept with a target for purchased energy consumption (for space heat, lighting and appliances) if 40 kWh/m^2. The normal Norwegian energy consumption is around 200 kWh/m^2. Measuring energy consumption per floor area is the only way to deal with diverse house designs and lifestyles. For example, the average home in Denmark has a floor area of 120 m^2 (1290 sq.ft.) compared to the Canadian average of 210 m^2 (2260 sq.ft.). Swiss houses, by Code, must incorporate a bomb shelter. In Japan the average hot water load is 400 Litres/day, compared to the European average of 145 litres/day or Canada's 350 litres/day.

Some of the approaches being taken in various countries had been dabbled with by Canadian low energy designers in the seventies: these include active solar heating with rock storage beds, and double envelope houses. Others include active solar hot water systems and solar electricity (photovoltaics).

Areas for research and development that look very promising include integrated mechanical systems, solar hot water, photovoltaics and district heating.

On balance, Canada not only measures up but is playing a leading role in the development of low energy building technology. Canada has had more experience with continuous air barriers, tighter houses and mechanical ventilation systems throughout the industry, not just in the demonstration houses. In addition, the Canadian housing industry is more familiar with computer modelling. The challenge is to translate this leadership into a competitive advantage and support Canadian products.

Research on energy systems in the building sector:

The Swedish example

Sweden is a small northern country that devotes considerable effort for research and development. Development into energy conservation and management in the built environment has been very active for 15 years now. Much of it was spurred by a lack of natural energy resources and a decision to phase out all nuclear electric generation. So what have they accomplished?

Energy use in Sweden has fallen by 80% of the original savings objectives. Total energy consumption in the building sector has decreased slightly from 1978 levels, despite a 20% increase in total building volume.

In new buildings, annual energy requirements need be no higher than about 10 kwh/sq.ft. (110-120 kWh/m2) for heating, domestic hot water, lighting and appliances and ventilation.

Although the total level of energy use has fallen, the use of electricity as a part of that energy has increased substantially due to fuel substitution. R-2000 houses have an annual energy consumption of about 9.6 kwh/sq.ft. (104 kwh/m2), while conventional houses built to 1975 standards use about 20 kwh/sq.ft. (217 kwh/m2).

During the 1980's, energy conservation work was concentrated on reducing the dependence on oil. During the 1990's, it is the overall environmental aspects and conservation in general that will guide the work. It is interesting to note that Sweden still lacks a long-term policy for implementation of new energy technologies in the built environment.

When total energy use is being considered, there is a tendency to look at one point at a time and to ignore the whole. Fuel sources such a nuclear power, hydro power, fossil fuels and energy conservation potential are all treated individually, without serious consideration for their mutual relationships and how the environment should

best be protected. The whole system of energy supply and production has an extremely high inertia, taking a very long time to change.

Energy supply in the built environment must not be seen through the eyes of central planners, focused on conditions in large urban areas. They must consider various alternatives to suit local conditions.

What about new technologies?

Heat pumps in their present form are regarded as a mature technology. The environmental hazard of CFC use has been recognized, and they are being replaced by alternate safer refrigerants. The next step is to develop a 'turbo heat pump' to utilise more effective heat pump processes at higher efficiencies (from current COP's of 3.5 up to 5).

The total level of energy use in the built environment can still be reduced by about 15% using existing and tried-and-tested technology.

However, a planned, long-term effort is needed to achieve this level of savings potential. It involves nothing less than changing the habits of energy use in every dwelling unit. Energy conservation measures in the built environment do not involve any question of sacrifice, but rather conservation of resources. In Sweden this would mean that appropriate retrofit measures would have to be taken in about 200,000 dwellings per year over a ten-year period.

This emphasizes the importance of political decisions to facilitate reduction in energy consumption.

This item is based on an interview with Bertil Pettersson (Acting Director General of the Swedish Council for Building Research) and Jan Lagerstrom (Head of the Department for New Energy systems, Swedish Council for Building Research). It originally appeared in the Newsletter of Swedish Building Research.

Is new technology the only way to get Energy Efficiency?

We are a society fascinated by technology. We expect that the only way to get the most efficient systems is to use the latest computerized equipment. But it is not always that complex nor need it be elaborate. More important is knowing what is required, and how to best achieve it.

Even obsolete systems may be very efficient if run properly. This especially applies in larger older buildings. What brings this to mind is a column by Dan Holohan in Plumbing & Mechanical, a U.S. trade publication.

The writer was in the Newark City Hall, a building dating back to the turn of the century that used waste steam from a steam engine to run the ejector (to remove air from the steam) and heat the building. The steam engine also ran a generator to produce electricity for the building (today we call this process "cogeneration"). The whole steam heating system was made more efficient. Even at the turn of the century they saved about 35% on the fuel bills.

The writer recognized the system because in the past a crusty old-timer had explained how this type of system works, so he was able to identify it. The information had been passed on by word of mouth. The writer was in the building to attend a meeting to discuss new energy regulations.

What brought attention to the heating system was that even in the winter windows were open and the building was roasting because the folks in charge had neglected the old heating system. They probably didn't understand it so at some point they had killed it.

All that remains are the high fuel bills from a mechanical system not operated efficiently, and the chances are that the steam system was slated to be "upgraded".

The irony is that the State of New Jersey has drafted an Energy Master Plan. The object is to save energy by encouraging people to use more efficient appliances, lighting and industrial equipment. It seems the utility companies are to get active in the equipment installation business.

What had been forgotten was the knowledge of hands on trades people that could be put to use to fine tune existing equipment. To save energy you have to close the windows and get the old-timers to speak about the systems already in place. The heating industry runs on oral history. Father explained it to his son who, in turn, will explain it to his son or daughter.

Field experience goes beyond technical manuals and system diagrams. Once installed the whole is much greater than the some of the parts. It may be like black magic, but only because so little knowledge is written down.

What good are high AFUE ratings and combustion efficiency if people are sweltering and opening windows due to improper installation or poor maintenance of equipment?

In new construction it's easy. But we must remember that energy conservation begins with the guys who know about heating systems. Fine tuning the tremendous number of inefficient atmospheric gas burners must be done before getting into equipment retrofits.

The bottom line is that there's an awful lot of building stock out there that will be with us for a long time. Well over 95% of the building stock in the year 2010 has already been built. Let's make sure it is running as effectively as possible, even with "out of date" technology before we get into expensive refits.

Need Some more information?

If you would like to get any more information about any items reviewed or discussed in this issue, contact us and we will pass on your request.

Plywood Standards revisions

The current status of Canadian Plywood Standards. (CSA 0121-M 1978, D.Fir Plywood and CSA 0151-M 1978, Canadian Softwood Plywood), are not being revised.

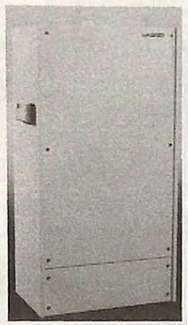
Canadian plywood manufacturers make exterior grade Softwood plywood only.

The performance standard for sheathing plywood that may limit uses to roof, wall and floor sheathing in light construction is being revised to allow plywood containing grade defects which exceed those permitted for Exterior plywood.

Proposed revisions include: an increase in maximum knot size to 3"; and maximum hole size to 3", subject to additional testing. "CD" Grade Plywood does not conform to current standards, nor to the proposed revised CSA 0325 Performance Standard. Revisions don't refer to "D" Veneer which allows defects that exceed those allowed in performance rated sheathing.

It will be possible under the proposed revision to rate some "CD" Grade Plywood (excluding that with the larger defects) but, it won't qualify as Exterior bond quality.

New commercial scale HRV



You thought you had a problem finding a place for the HRV in your last house? It could have been worse! Look at the new new VanEE ECM 450, the latest from Van EE. Fortunately, you won't have to find a spot for it in your next house.

The ECM 450 was designed for use in portable classrooms which have major air quality problems. The stand alone unit has flow rates of 350 - 600 CFM with heating and cooling capabilities, and a heat recovery efficiency of 60-70%. If you are doing work for schools, designated smoking rooms, labs, or other spaces that require special

Index to Past Issues No. 31 - 36

Index to issues 1-24 appeared in SOLPLAN REVIEW No. 26; No's 25-30 were indexed in issue No. 31

Advance House a reality April-May 1990 No. 32
Air Sealing techniques, Effectiveness of Aug-Sept 1990 No. 34
Air flows within rooms (Is the Window open of closed? Can you Tell?) June-July 1990 No.33
Airtightness of New Detached Houses April-May 1990 No. 32
Attic Turbine Ventilators Dec-Jan 1991 No. 36

B.C. Energy Efficiency Act Aug-Sept 1990 No. 34
Barrier-Free Design: Publication Review Feb-Mar 1990 No. 31
Blown-in-Blanket Receives Canadian approval Aug-Sept 1990 No. 34

Caulks & Sealants June-July 1990 No. 33
Chimney Performance Feb-Mar 1990 No. 31

Depressurization Limits for Mid-efficiency gas fired furnaces in houses Sebastian & Peter Moffatt Feb-Mar 1990 No. 31

Earthquake Design April-May 1990 No. 32
EEBA Conference (1990) Mario Kani June-July 1990 No. 33
Environmental Choice construction products April-May 1990 No. 32

Filtration: getting the most out of filters Dec-Jan 1991 No. 36
Fireplace Air Requirements Aug-Sept 1990 No. 34
Fireplace Dampers: product update June-July 1990 No. 33

Gas Fireplace: Direct vent units update June-July 1990 No. 33
Gas fireplace alert (3) Oct-Nov 1990 No. 35
Green Homes: environmentally friendly housing Oct-Nov 1990 No. 35
GST checklist Dec-Jan 1991 No. 36

Housing the environmentally sensitive Oct-Nov 1990 No. 35
Innovator of the year 1989 award April-May 1990 No. 32
Light fixture connector: product review Dec-Jan 1991 No. 36

Monocoque Building Oct-Nov 1990 No. 35
Northern Building Science Centre Oct-Nov 1990 No. 35
Northern Building Science Centre Aug-Sept 1990 No. 34

Paint & Siding Failures due to Insulation Joseph Lstiburek Feb-March 1990 No. 31
Permanent Wood Foundations: Book review June-July 1990 No. 33
Power Smart: B.C. Hydro energy conservation program Dec-Jan 1991 No. 36
Professional Builder: is this you? June-July 1990 No. 33
Pulse Builder Survey of construction practices April-May 1990 No. 32

Radiant barriers (attic) Dec-Jan 1991 No. 36
Recraft Home 90: innovative building technology demonstration home Dec-Jan 1991 No. 36

Smoke alarms: costs and benefits Oct-Nov 1990 No. 35
Squeaky floors Dec-Jan 1991 No. 36
Super Window Feb-Mar 1990 No. 31

Vapour barriers: how important are they? Oct-Nov 1990 No. 35
Ventilation Case Study: the importance of noise levels April-May 1990 No. 32
Ventilation Equipment effectiveness Oct-Nov 1990 No. 35
Ventilation system fitting April-May 1990 No. 32
Ventilation: how to comply with 1990 Building code requirements Review Aug-Sept 1990 No. 34
Ventilation: cost implications of CSA F326 June July 1990 No. 33
Vinyl flooring problems June-July 1990 No. 33

Waste Management In Construction: making a molehill out of a mountain April-May 1990 No. 32
Window Performance: what are the real R-values Aug-Sept 1990 No. 34
Windows: Testing for gas fill Aug-Sept 1990 No. 34

Zero Energy House: proposal for a second generation low energy house Oct-Nov 1990 No. 35

If you are missing any back issues, a limited quantity are still available at $4.00 per copy (PLUS .28 GST IN CANADA).

SOLPLAN REVIEW, Box 86627 North Vancouver, B.C. V7L 4L2

It seems the competition is making a lot of NOISE!

And that's just one of their problems. A Heat Recovery Ventilator must do more than answer your needs. It must also answer your customers'. Flair HRV's accomplish both with a full range of compact, residential and semi-commercial models.

1. Flair HRV's are the quietest running—up to 50% quieter than closest competitor.

Flair vs Competition

	Flair 3055 Compact vs	Flair 5585 Compact vs	
	vanEE 1000	vanEE 2000-2DM	Lifebreath 200 Max
Bedroom	- 7.0 db	- 8.6 db	- 8.7 db
Total	- 5.0 db	- 4.5 db	- 4.6 db

N.B.: Decibel levels vary between intake and distribution operations which is why total levels do not match single room levels. Tested in accordance with ASHRAE standard #68-1986.

2. Best warranty available: 5 years on parts, lifetime on the core.

	FLAIR	Lifebreath	vanEE
ALL PARTS	5 yrs	2 yrs	2 yrs
CORE	Lifetime	15 yrs	Lifetime

Source: Manufacturers brochures 1990

3. Highest recovery rate of any HRV.

4. Built to last by Venmar Ventilation Inc., Canada's largest residential ventilation manufacturer.

Get the facts from your ventilation specialist. Or call 1-800-567-0946 for the Flair info kit.

FLAIR
BY VENMAR VENTILATION INC
A quiet air of dependability

SUBSCRIBE TODAY!

SOLPLAN REVIEW is an independent Canadian newsletter published 6 times per year to provide news, technical details, new product information, insights and commentary on developments covering all aspects of building science and energy efficient building practice for new and retrofit residential construction.
SOLPLAN REVIEW serves the needs of professional and interested lay persons. Technical information is presented in a clear, concise manner, without resorting to jargon.
YES, I WANT TO SUBSCRIBE TO SOLPLAN REVIEW

In Canada: 1 year: $38.52 ($36.00 + 2.52 GST)
2 years: 72.76 ($68.00 + 4.76 GST)
USA and other foreign: (u.s.a. and other foreign in u.s. funds).
1 year: $ 43.00 per year; 2 years: 82.00

payment enclosed please bill us P.O. # _____

please charge to credit card:
VISA MASTERCARD AMERICAN EXPRESS

card number: _____ expiry date: _____

signature: _____

name: _____

address: _____

_____ post code: _____

the drawing-room graphic services ltd.
box 86627 north vancouver b.c. V7L 4L2

THE NEW
AIRCARE™
RESIDENTIAL VENTILATION PRODUCT LINE

- **Central Exhaust Ventilators (CEV's)**
- **Swedish through-wall Draft Free Fresh Air Inlets with filters**
- **Italian through-wall and through-window Low Noise Fans**
- **Recirculating Central Ventilators (RCV's)**
- **Heat Recovery Ventilators (HRV's)**

OUR INNOVATIVE FEATURES WILL RESULT IN LOW TO MEDIUM INSTALLED COST, CONTINUOUS DISTRIBUTED VENTILATION SYSTEMS.
The benefit:
"AFFORDABLE INDOOR AIR QUALITY"

Specialist Ventilation Dealer enquiries invited.

ENVIROSCIENCE PRODUCTS LTD.
1962 West Broadway, Vancouver, B.C. V6J 1Z2
Phone (604) 734-4211 Fax (604) 734-0520